

**PCT**WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>B41M 5/00, 5/34, G03G 7/00, B41J 3/54</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/62721</b> <b>(43) International Publication Date:</b> 9 December 1999 (09.12.99)
<b>(21) International Application Number:</b> PCT/US99/12257 <b>(22) International Filing Date:</b> 2 June 1999 (02.06.99)  <b>(30) Priority Data:</b> 60/088,273 5 June 1998 (05.06.98) US  <b>(71) Applicant:</b> PRIMERA TECHNOLOGY, INC. [US/US]; Suite 375, Two Carlson Parkway North, Plymouth, MN 55447-4446 (US).  <b>(72) Inventor:</b> HAGSTROM, Erick; 19805 Old Sturbridge Road, Hamel, MN 55340 (US).  <b>(74) Agents:</b> WESTMAN, Nickolas, E. et al.; Westman, Champlin & Kelly, P.A., International Centre, Suite 1600, 900 Second Avenue South, Minneapolis, MN 55402-3319 (US).		<b>(81) Designated States:</b> AU, CN, JP, KR, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> METHOD OF APPLYING A BASECOAT SUITABLE FOR PRINTING THEREON  <b>(57) Abstract</b>  The process of printing onto a substrate (18, 60) that is not receptive for the print coating including providing a base coating (40, 66) that adheres to the substrate (18, 60) and is receptive to the printing to be applied. The applying of the base coating (40, 66) will be over at least a desired area of the substrate (18, 60) and generally over the entire surface of the substrate (18, 60) that is to be printed. The printing can take place using normal print techniques.		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

**METHOD OF APPLYING A BASECOAT SUITABLE FOR PRINTING THEREON**BACKGROUND OF THE INVENTION

5 The present invention relates to a printing process utilizing a film or web carrying a base coat material that will transfer to a substrate for providing printable surfaces. The film or web also can have a number of panels of color coatings so the colored images can be transferred to the base coat on the substrate.

10 Direct multiple color thermal printing technology traditionally has been used for custom label and ticket printing, as well as for identification cards and the like. The thermal transfer printers introduce another medium, usually a print ribbon, film or web, 15 between the thermal imaging printhead and the article or substrate to be printed.

A great number of substrates, because of their surface characteristics, remain unprintable with the thermal print ribbon methods. That is, attempts at 20 printing on a specular, (mirror-like) non-white, and other non-traditional surfaces, including, but not limited to, compact discs (CDs), recordable compact discs (CD-Rs), non-white ID cards, metallic surfaces and glass surfaces currently result in undesirable image 25 quality. Further, the images do not remain readable for long periods of time.

The poor quality printing can be a result of many factors. On specular surfaces, the image is washed out by the overwhelming ambient light reflected back by 30 the unimaged or unprinted areas. On non-white surfaces, the image is dulled due to the fact that the print imaging is a subtractive process and good color definition requires the full spectrum of reflected light from which the deposited colors can be "subtracted".

-2-

SUMMARY OF THE INVENTION

The present invention relates to a base coating thermal transfer printing process that introduces a full coverage base coat layer applied to the substrate and onto which subsequent images are printed. A base material layer is printed onto the substrate using materials that are compatible with the substrate, and which will adhere to the substrate to form a uniform layer. The base material that is transferred to the substrate also is capable of receiving the normal printed images from the thermal transfer printer using the colors that are normally found on a print ribbon, film or web.

The base layer would typically be, but is not limited to, a large white area applied to a substrate within the printer. It is a coating that is transferred from the ribbon and applied by the printer. The image that is to be printed then would be applied on top of the white base layer in the conventional manner for thermal transfer printing, and the printed image is of higher quality than it would be without the base coat because the base coat provides the printed image with a uniform background that provides for good color definition, and a full-spectrum of reflected light.

The base coat material also includes compounds that would adhere to surfaces that would not typically be receptive to standard wax, resin or wax-resin composite and dye sublimation print ribbons, which are commercially available.

For any of the print technologies, the base coat material can be clear, white or a selected color that will provide an adequate background, depending on the print finish to be created.

-3-

When used with thermally transferred dye sublimation printing, the base coat material is essentially an adhesive into which the thermal dye vapors will diffuse. Polyvinyl alcohol, polyvinyl chloride, polyvinyl acetate or a blend of these materials are examples of adhesives into which thermal print dye vapors will diffuse and which will adhere to polycarbonate discs, to acrylic varnish finishes typically found on discs such as for CDs, and to other non-traditional surfaces, such as the specular surface or a polyester surface that is used for identification cards. As disclosed, the thermal transfer ribbon will include a series of panels, in a repeating pattern, and the leading panel of each pattern carries the base coat material that would be printed onto the substrate prior to printing any of the subsequently following colors. In an alternate form, a two-step process could be utilized, one including a monochrome base coat ribbon, film or web, that would be heated with a heated roller or print head to apply the base coat to the substrate separately, before transferring any of the images, and then subsequently a printhead would be used for the thermal printing transfer.

Once the base coat is added, the printing of images onto the substrate proceeds in a normal manner.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic representation of a typical thermal printer using a base coating for applying to a substrate in accordance with the present invention;

Figure 2 is a flat lay-out of a print ribbon including a base coating material panel that is used for applying an initial base coating onto a substrate;

-4-

Figure 3 is a view of the ribbon of Figure 2 on supply and take-up rolls;

Figure 4 is a schematic representation of a modified form of the present invention utilizing two printing assemblies;

Figure 5 is a flat lay-out of a monochromatic ribbon, film or web carrying a base coating layer only;

Figure 6 is a side view of the film of Figure 5 shown on supply and take-up rolls; and

Figure 7 is a schematic representation of a heated roller for applying the base coat before printing.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A thermal printer is shown schematically at 10, and it is of conventional design that has a printhead 12 with very small heat elements comprising resistors at a lower end 14 that heat when current passes through them. There are approximately 8 to 24 heat elements per millimeter of traverse width of the printhead 12. The heat elements transfer an imaging compound, such as a wax, resin, wax-resin composite or dye from a ribbon, film or web 16 to a substrate 18. The ribbon, film or web is mounted onto a supply roller 20, driven by a motor 20A and is taken up by a take-up roller 22 driven by a motor 22A. The substrate 18 is provided from a disc supply feed indicated at 24. The substrate can be a compact disc (CD), for example, or a label, greeting card, paper, identification card or similar object. The substrate is fed by a drive roller 26 that has a pinch roller 27 above it. The drive roller 26 is driven with a motor 26A from a central control 30 that would also control the motors 20A and 22A as well as the printhead and other motors and functions that are necessary.

-5-

The substrate 18 and ribbon 16 are driven across the printhead 12 using a platen 32 driven by a motor 32A. The platen will drive the substrate 18 and ribbon and hold them in intimate contact against the printhead. The ribbon 16 is also driven by the motors 20A and 22A, and the ribbon, film or web 16 can have a suitable tension maintained by controlling the motors 20A and 22A.

The printer also has a substrate drive and feed roller 36, driven by motor 36A and operated with a pinch roller 37 on the output side of the printhead 12, to receive the substrate 18 after printing and move it to a desired location for further processing or for storage.

Images are created on the substrate 18 by control of heat elements 14 to selectively apply the imaging compound to specific areas of the substrate and thus print images of various kinds including writing, photographs and the like.

Colors are created with multiple passes of a paneled ribbon or substrate 16, combined with dithering techniques, as is known, to create several perceived colors. As the ribbon is moved, the printhead is raised and lowered as needed with a printhead lift 13 controlled by control 30.

The ribbon, web or film 16 is shown in Figure 2 in flat lay-out, and it includes a plurality of panels having different compounds on the surface that faces the substrate as the ribbon passes under the printhead 12. As shown, there are a series of individual panels including a base coat material 40, a yellow panel 42, a magenta panel 44, and a cyan panel 46, each in an identifiable and separate panel. The base coat and color panels repeat in sequence, and are separated by an

-6-

identification or encoding strip 48, so that each series of color panels can be identified as it comes past the sensor shown at 50 in Figure 1. The sensor 50 is coordinated with a sensor 52 for sensing the leading edge of a disc or substrate 18, so that the panels and the substrate are coordinated or synchronized to ensure that the images to be printed will be indexed properly with the substrate.

The ribbon 16 is shown in Figure 3 with supply and take-up rolls as well. It is unwound from the supply and then wound up on the take-up roll after it is processed.

The present invention relates to providing the base coat material panel 40, which can be any desired base color, (typically white) or clear, that would be printed onto the surface of the entire substrate, or at least on the surface area of the substrate where a colored or further printed image is to be placed. The base coat material, as previously stated, could be a base coat white, clear or color, depending upon the print or finish to be created. The base coat material is placed on the surface of the ribbon, film or web that faces the platen, so that when the substrate comes underneath the printhead and the printhead is activated, the base coat will be heated beneath the printhead as shown, and transferred from the ribbon to the substrate to provide a uniform coat or film over the entire substrate, or the area of interest. This base coat is of a material that will accept the diffusion of the dyes or adhesion of the resins from the colored panels 42, 44 and 46. The base coat material is selected to be print receptive or receptive of the resin or other materials that are used on the ribbon for creating the color panels. If the base coat is white or a neutral color,



-7-

the following colors or yellow, magenta and cyan can be used for creating a high quality dithered colored image. A clear coat is used to make the surface print receptive without changing the background color.

5           Again, the method relates to applying a uniform base coat onto the substrate which has a surface that is not print receptive, meaning the print materials do not adequately adhere to or sublimate into the surface, and subsequently applying the printed images to  
10 the base coating. Printing colors, images or monochromatic information onto the base coat ensures that the thermal printing, or other printing, will adhere satisfactorily to the substrate. Also, where the color of the substrate surface is not conducive to  
15 obtaining true colors when printing, the base coating can be used.

          In Figures 4, 5 and 6, a modified form of the invention is shown wherein there is a set of printheads. The disc supply feed 24 is illustrated, and a substrate  
20 60 is shown being driven through drive rollers 62 driven by motors 62A. A pinch roller is also used, and will drive the substrate under a printhead 64, that is the same as printhead 12. A hot roller can also be used instead of a printhead. A sensor 50 is used to identify  
25 marks on a ribbon 66 as previously explained. A sensor 52 is provided for sensing the substrate 60. The platen 32 is the same as in the first form of the invention and is driven by motor 32A, but in this case, the ribbon, film or web 66 is a monochromatic ribbon, containing  
30 only the base coat. The ribbon 66 is supported on a supply roll 68, and is taken up by a take-up roller 70. The rollers have motors 68A and 70A for driving them.

          An output substrate drive roller 36 is provided as in the first form of the invention.

-8-

The ribbon 66 as stated, is monochromatic, and as shown in Figure 5, has a uniform coating of a print receptive material thereon. Polyvinyl alcohol, polyvinyl chlorides, polyvinyl acetate, or a blend of those substances are examples of adhesives into which the dye vapors from the regular colored panels of a conventional dye sublimation print ribbon will be accepted. The polyvinyl alcohol, polyvinyl chloride and polyvinyl acetate, or blends will directly adhere to polycarbonate discs, acrylic varnish finishes, or other non-traditional surfaces of the substrate 60 so the uniform base coating is provided to permit the printing. As shown, the ribbon 66 can have marks or indicia either with a transverse stripe 67, or with small marks 67A along the edges of the ribbon to identify particular positions as sensed by sensor 50. However, since the base coat is uniform on the ribbon or web 66, the main concern is that there is an adequate coating deposited onto the substrate so that the substrate will carry a substantially uniform thickness and uniform appearing base coat before printing images or information on the substrate.

The basecoat material selected for the monochromatic ribbon will depend upon the materials making up the substrate and the print method to be used, for example wax resin thermal transfer, dye sublimation thermal transfer, ink jet or laser printing.

After the substrate 60 has been provided with the base coat at printhead 64, the disc 60, shown in dotted lines in Figure 4, will be transferred by a first roller 36 and motor 36A to a second print station 73 on the same printer frame 72. The second print station 73 comprises a printhead 74 that is a heated head as before, and which has a platen 32 driven from a motor

-9-

32A in the same manner as the other platens shown. The printhead 74 has heat elements that will transfer colored images from a ribbon 76 provided from a supply roll 78 using a motor 78A, and taken up by a take-up roller 80, driven by a motor 80A. The ribbon 76 is modified from that shown in the first form of the invention by having only the colored panels that are shown, or a clear panel as a lead-in, or if desired, a black panel. In any event, ribbon 76 will have the colored panels 42, 44 and 46 so that the images can be printed onto the base coat covered surfaces of substrate 60 supported by the platen 32 under the printhead 74. A further drive roller 36 for the substrate on the left hand side of the printhead 74 also can be used for driving the finished substrate to a desired location.

Thus, it can be seen that conventional printheads can be used for applying a base coating onto surfaces that are not receptive to printing to provide a surface that is receptive to printing. It should also be noted that the printheads can have lifts 13 that are operated from the controller 30, to lift the heads to permit the ribbons or films to be moved back and forth to ensure, in the case of the printhead 64, that all of the base coat is used, without substantial waste, and in the case where color printing takes place, to provide for the back and forth movement to ensure that the color desired appears on the substrate.

The layer of base coating material on the ribbon, film or web is heated beneath the printhead, and the base coat is transferred from the ribbon to the substrate surface and adheres thereto. The base coat exposed surface is then available to accept the resin colors onto a white surface or diffusion of the dyes from a dye sublimation ribbon and printer, for example,

-10-

to create the printed images. The base coat material can either be transferred to large areas of the substrate prior to dye diffusion on the base coat, or can be transferred to only the relevant print area.

5           In Figure 7, printer 79 has a heated roll 82 shown preceding a printhead for applying a base coat from a separate ribbon 66, as shown in Figure 4.

          Then an inkjet printer (both called a direct printers) or laser printer 84 can be used for printing  
10   on the CD. A platen 32C and motor 32D can be used with the printer. The other drive and feed rollers can remain the same, as shown.

          All the drive components of Figure 4 are the same. The heated roll 82 can be heated in any desired  
15   manner with a heater 86 as controlled by control 30.

          The base coat needs to adhere to the substrate being used and accept the print material used to create the colors of the selected print method.

          Although the present invention has been  
20   described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

-11-

WHAT IS CLAIMED IS:

1. A process for printing an image onto a substrate, which substrate is of material which is not print receptive, comprising applying a base coating over the substrate in at least selected areas to provide a coating adhering to the substrate, and printing an image onto the base coating and substrate.
2. The process of claim 1 comprising providing the base coating on a surface of a film used with a printhead before applying the base coating to the substrate.
3. The process of claim 2 further comprising providing a supply of continuous film carrying the base coating, and passing the film from the supply under a heated printhead for applying the base coating to the substrate.
4. The process of claim 3 comprising providing a film having the base coating as a separate panel on the film, and providing panels of desired colors adjacent the base coating panel, thereby forming a color sequence segment, the segments forming only a portion of the film passing under the heated printhead.
5. The process of claim 2 wherein said printhead is a thermal printhead, and comprising heating the printhead for applying the base coating to the substrate.
6. The process of claim 2 wherein said base coating is provided on a separate film, and applying the base coating to the substrate prior to printing images on the substrate from another film.
7. The process of claim 6 wherein there are two printheads, the applying step comprising printing a base coating layer on the substrate at a first printhead, said base coating layer being print receptive, and

-12-

subsequently printing images on the base coating carried on the substrate.

8. The process of claim 1 comprising providing said base coating as a uniform color that is substantially white.

9. The process of claim 1 comprising including providing a ribbon having a base coating that is a uniform light color.

10. The process of claim 4 including providing indicia indicating at least a start of a base coating panel and a color sequence segment on the film.

11. A process of printing onto a surface of a substrate made of materials to which printing materials do not satisfactorily adhere comprising applying a coating of a base material which adheres to the substrate onto the substrate, and printing an image onto the base material on the substrate.

12. The process of claim 11 including the step of selecting the substrate to have a surface that is one of the group consisting of a polycarbonate surface, an acrylic or varnish finish, a specular finish and a polyester surface.

13. The process of claim 11 comprising selecting the base coating to be one of the materials from a group consisting of polyvinyl alcohol, polyvinyl chloride, polyvinyl acetate or a blend of these materials.

14. The process of claim 11 comprising first applying the base coating on the substrate using a heated printhead, transferring the substrate to a second printhead and printing the images onto the base coating on the substrate.

15. The process of claim 11 comprising first applying the base coating on the substrate using a heated roller against a ribbon carrying the base

-13-

coating, and moving the substrate to a printer and printing on the base coating.

16. The process of claim 15 wherein the printer comprises a thermal printhead.

17. The process of claim 15 wherein the printer is one selected from the group consisting of a laser printer and an inkjet printer.

1/3

FIG. 1

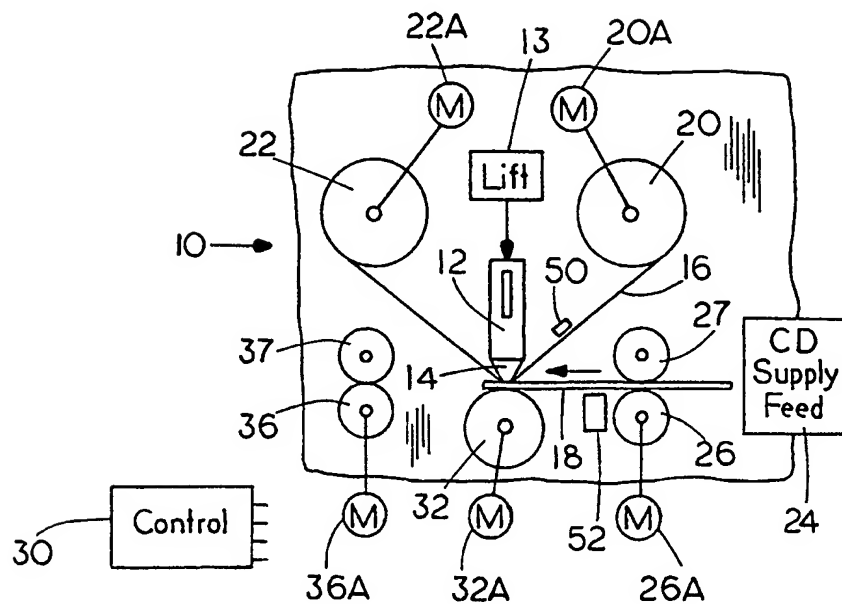


FIG. 2

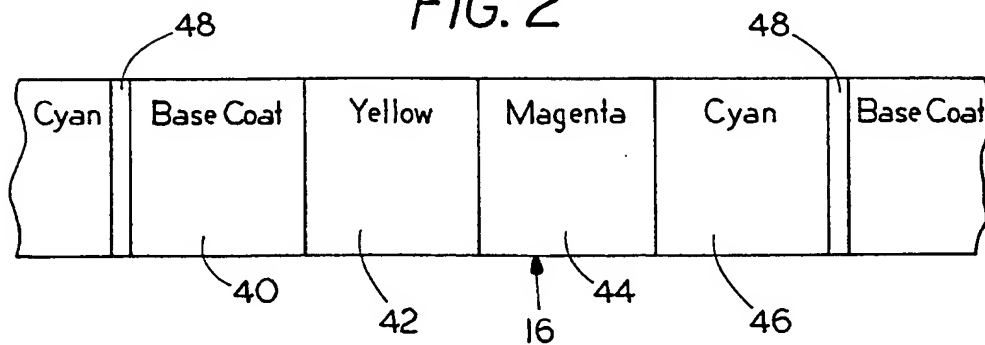


FIG. 3

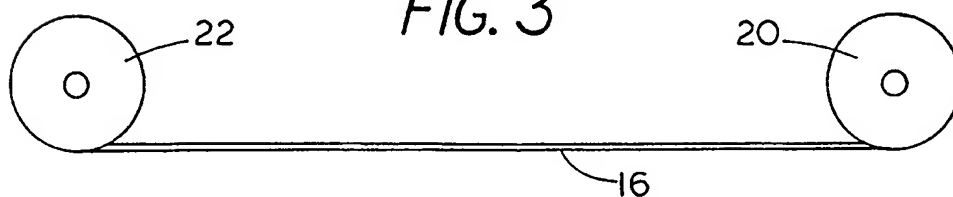




FIG. 4

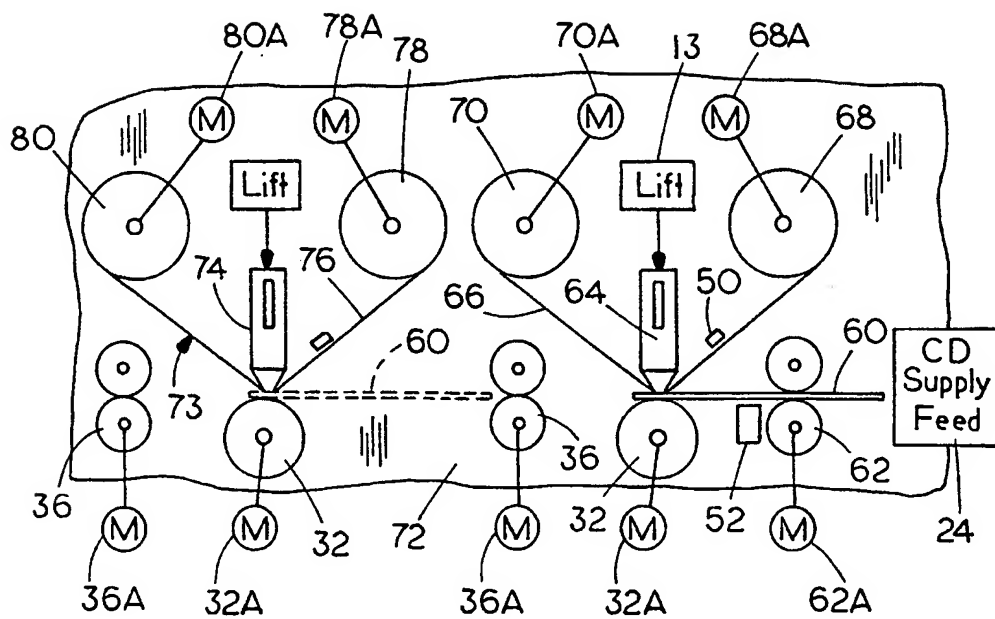


FIG. 5

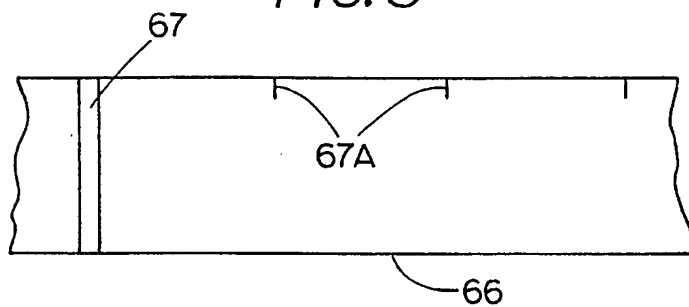


FIG. 6

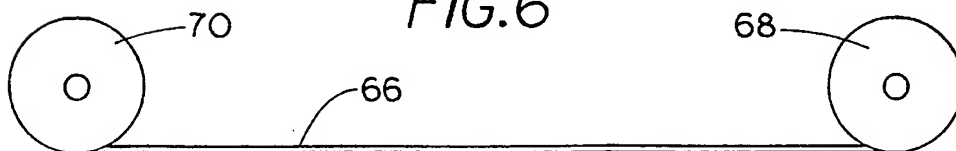
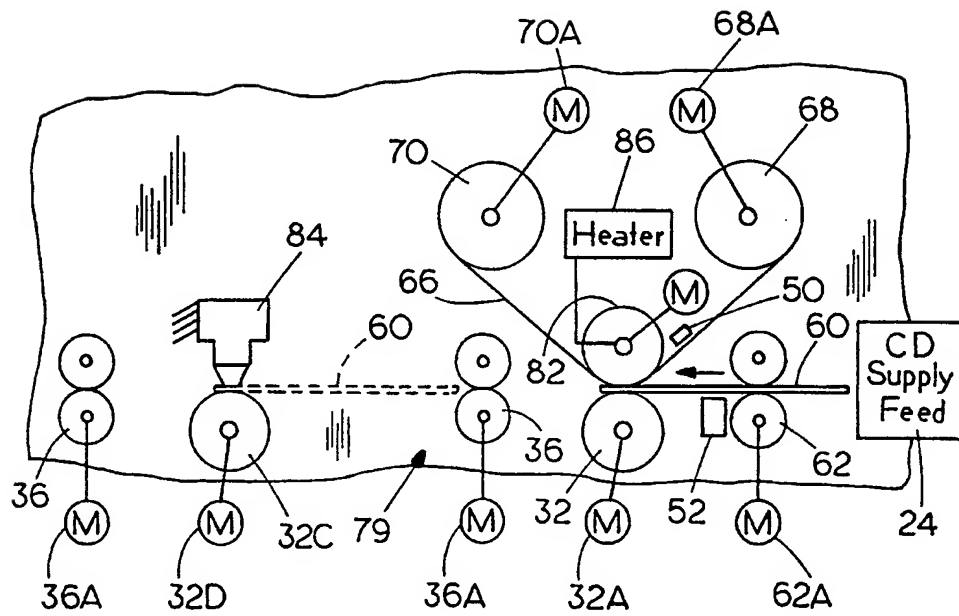


FIG. 7



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/12257

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B41M5/00 B41M5/34 G03G7/00 B41J3/54

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B41M G03G B41J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 780 238 A (NCR INT INC) 25 June 1997 (1997-06-25) column 3, line 9 - column 6, line 33 column 7, line 1 - line 46 figures claims	1-17
X	PATENT ABSTRACTS OF JAPAN vol. 010, no. 261 (M-514), 5 September 1986 (1986-09-05) & JP 61 086289 A (MITSUBISHI ELECTRIC CORP), 1 May 1986 (1986-05-01) abstract	1-17

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

30 August 1999

Date of mailing of the international search report

07/09/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Markham, R

# INTERNATIONAL SEARCH REPORT

Inter. l. Application No

PCT/US 99/12257

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 012, no. 218 (M-711), 22 June 1988 (1988-06-22) & JP 63 017089 A (TOPPAN PRINTING CO LTD), 25 January 1988 (1988-01-25) abstract ---	1-17
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 471 (M-773), 9 December 1988 (1988-12-09) & JP 63 193861 A (NEC CORP), 11 August 1988 (1988-08-11) abstract ---	1,11
A	US 5 748 204 A (HARRISON DANIEL J) 5 May 1998 (1998-05-05) the whole document ---	1,11
A	DATABASE WPI Section PQ, Week 9621 Derwent Publications Ltd., London, GB; Class P75, AN 96-204508 XP002113694 & JP 08 072326 A (CANON KK), 19 March 1996 (1996-03-19) abstract -----	1,11

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/12257

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0780238 A	25-06-1997	US 5776280 A JP 9234965 A	07-07-1998 09-09-1997
JP 61086289 A	01-05-1986	NONE	
JP 63017089 A	25-01-1988	NONE	
JP 63193861 A	11-08-1988	NONE	
US 5748204 A	05-05-1998	NONE	
JP 8072326 A	19-03-1996	NONE	